

DRAWINGS ATTACHED.

*Inventor:—ERNEST ALCOCK.**Date of filing Complete Specification: June 7, 1962.**Application Date: June 7, 1961. No. 20627/61.**Complete Specification Published: June 10, 1965.*

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COMPLETE SPECIFICATION.

Improvements in or relating to the Fluidising of Bulk Materials.

We, MONO PUMPS LIMITED, a British Company of Mono House, 1 Sekforde Street, London, E.C.1. do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

THIS INVENTION relates to the fluidising of powder and like bulk materials and is particularly concerned with the provision of a flexible mat through which fluidising air may be supplied to the interior of a hopper or other container or receptacle.

According to the invention there is provided a flexible fluidising mat comprising flexible air permeable membrane and a flexible air impermeable membrane and a flexible spacer sheet sandwiched between the backing sheet and membrane, said spacer sheet having therethrough apertures forming chambers between the backing sheet and membrane, one or more inlets being provided for the supply of air to said chambers, the arrangement of chambers and inlets being such that air passing through said inlet or inlets is distributed to a substantial portion of the fluidising membrane.

The flexible fluidising mats of the present invention are particularly suitable for applying to the inside surfaces of existing containers for enabling them to be used for the storage or conveying of powder. The mats can be used to fluidise powder in the container to facilitate delivery of the powder from the container by pumping or gravity feed. In addition to the easy adaptation of such flexible mats to awkward or curved surfaces, they can be applied with a minimum of alteration to existing containers. Welding and cutting away of metal

plates is avoided, the container being drilled to take fixing bolts.

The flexibility of the mat is also of advantage when the openings in an existing container are restricted in size, since the mat can readily be rolled up, or otherwise deformed, for passage through such a restricted opening before opened out and spread and fastened to the desired internal surface of the container. The invention is also applicable for use in a "DRACONE" (Registered Trade Mark) of other flexible container designed for use in the waterborne transport of liquids but which, because of the mat, may be used to transport powders, the powder being fluidised during filling or discharging of the container.

Preferably, the spacer sheet is in the form of a grid or rectangular, hexagonal or any other suitable form, air gaps being provided in some of the narrow strips of material forming the grid to permit the distribution of fluidising air to substantially the whole of the air permeable membrane.

It will be appreciated that a strong structure may be provided by bonding the spacer sheet both to the backing sheet and the air permeable membrane. In this manner the various narrow strips of the spacer sheet material are held in the required position to define the chambers and air gaps.

In order that this invention may be more readily understood, reference will now be made by way of example to the accompanying drawings in which:—

Figure 1 is a plan view of one embodiment of a flexible fluidising mat according to this invention;

Figure 2 is a perspective view illustrating

[Price 4s. 6d.]

the construction of the mat of Figure 1;

Figure 3 is a section on the line III—III of Figure 1;

Figure 4 is a perspective view illustrating a mat similar to that of Figure 1 used in a hopper;

Figure 5 is a section through part of the mat and hopper wall, the mat section being on the line V—V of Figure 1; and

Figure 6 is a section through part of the mat and hopper wall at the upper edge of the mat.

The mat illustrated is rectangular in plan and comprises three laminae bonded together, these laminae being a backing sheet 1 of a flexible air impermeable material, a spacer sheet 2, also formed of a flexible air impermeable material, and a fluidising membrane 3 of a flexible air permeable material.

The spacer sheet 2 is largely cut away to provide air chambers 4 for distributing fluidising air to the inner surface of the membrane 3, these cut away portions in the embodiment illustrated comprising six relatively large rectangular areas separated by narrow strips 5 of spacer material through some of which are cut air gaps 6 to connect the chambers 4 in two groups of three. The strips 5 are sufficient to maintain the fluidising membrane 3 spaced from the backing sheet 1 and to provide adequate areas for bonding of the spacer sheet 2 to both the backing sheet 1 and fluidising membrane 3.

An air inlet 7 is provided to each of the two groups of chambers 4 for the supply thereto of fluidising air. As shown in Figure 5, each air inlet 7 comprises a hollow threaded bolt 8 passing through the backing sheet 1 and having its head located in a chamber 4. Preferably, as shown, the depth of the head is equal to the thickness of the spacer sheet 2 so as to act as a further spacing support for the fluidising membrane 3. Crossways 9 are provided in the head of the bolt 8 to provide for the passage of air from the bolt to the chambers 4. The provision of a screw-thread on the bolt 8 enables the latter to be used for securing the mat to a container or receptacle wall.

Additionally for the purpose of securing the mat to a container or receptacle wall, holes 10, conveniently countersunk as shown in Figure 3, through which may be passed bolts or screws, are provided through the mat at positions where the spacer sheet strips are located and mainly around the peripheral margin of the mat.

A suitable material for forming the backing sheet 1 and spacer sheet 2 of the above described mat is rubber, and a particularly suitable material for forming the membrane 3 is the permeable high density

polyethylene sold under the Registered Trade Mark "VYON". Advantageously, the mat may comprise a rubber backing of a thickness of $3/16$ ", a rubber spacer sheet of a thickness of $1/4$ " and a "VYON" membrane of a thickness of $1/8$ ". The permeability of the latter would be of the order of 10 cubic feet per minute per square foot at a pressure of 8" water gauge.

The mat of this invention may be used to line one or more walls of any receptacle or container. It could, for example be used to line the lower half of the internal surface of a cylindrical conduit so as to enable the conduit to be used in a slightly inclined position as an air slide.

A further typical installation of such a mat is in a hopper. Figure 4 shows a mat of the form described above in use in an offset conical hopper. The mat is not necessarily rectangular in plan but will be of such a size and shape as to suit the hopper concerned. As shown, the mat is bolted inside the portion of the wall 11 of the hopper which is least inclined to the horizontal. The mat is secured to the hopper wall by bolts 12 passing through the holes 10 in the mat and also by a nut 13 and washer 14 secured on both of the inlet bolts 8, the latter extending through holes in the hopper wall 11.

As shown in Figure 6, a wedge shaped fillet 15 of rubber or other flexible material is fixed by adhesive in position at the upper edge of the mat to eliminate the ledge which would otherwise be formed there and on which powder would tend to settle.

WHAT WE CLAIM IS:—

1. A flexible fluidising mat comprising a flexible impermeable backing sheet, a flexible air permeable membrane and a flexible spacer sheet sandwiched between the backing sheet and membrane, said spacer sheet having therethrough apertures forming chambers between the backing sheet and membrane, one or more inlets being provided for the supply of air to said chambers, the arrangement of chambers and inlet or inlets being such that air passing through said inlet or inlets is distributed to a substantial portion of the fluidising membrane.

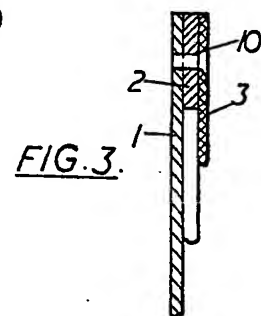
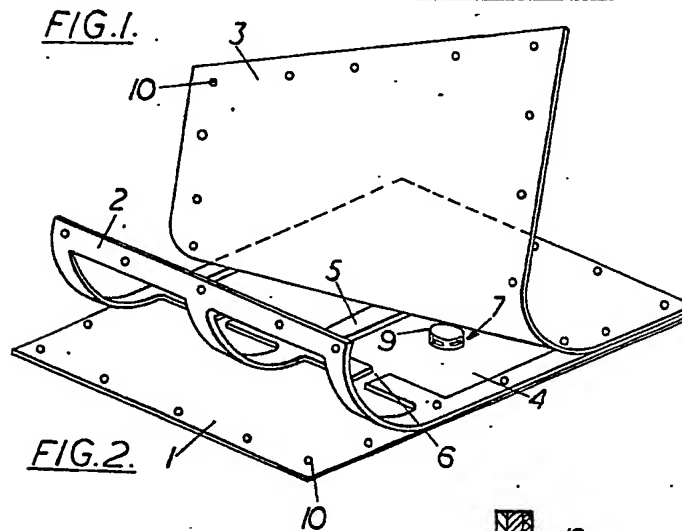
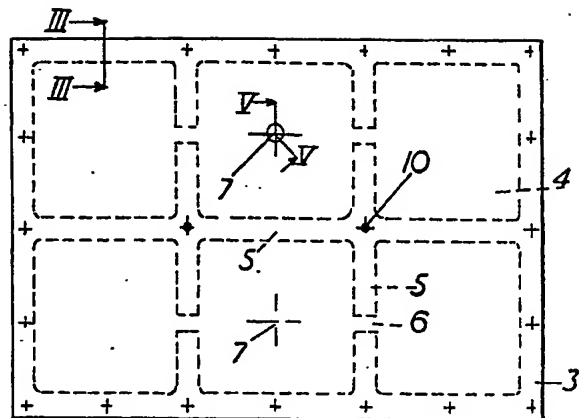
2. A flexible fluidising mat according to claim 1, wherein the spacer sheet is in the form of a grid; air gaps being provided in some of the narrow strips of material forming the grid.

3. A flexible fluidising mat according to claim 2, wherein the apertures of the grid are rectangular.

4. A flexible fluidising mat according to any preceding claim, wherein the backing sheet, spacer sheet and membrane are secured together by bonding.

5. A flexible fluidising mat according to any preceding claim, wherein for the purpose of enabling the mat to be secured to the wall of a container or receptacle, the mat is provided at suitable positions with holes passing through the backing sheet, spacer sheet and membrane for receiving fixing means such as bolts or screws.
6. A flexible fluidising mat according to claim 5 wherein said holes are countersunk at the end emerging from the air permeable membrane.
7. A flexible fluidising mat according to any preceding claim, wherein the or each air inlet comprises a hollow bolt, the head of which is positioned in the or one chamber and the shank of which projects outwardly through the backing sheet.
8. A flexible fluidising mat according to claim 7, wherein the depth of the bolt head is equal to the thickness of the spacer sheet.
9. A flexible fluidising mat according to claim 7 or 8, wherein said bolt head has therein cross ways providing for the passage of air from the interior of the bolt to the chamber in which the bolt head is located.
10. A flexible fluidising mat according to claim 7, 8 or 9, wherein the bolt is externally screw-threaded to receive a nut whereby the bolt may be used to secure the mat onto a container or receptacle wall.
11. A flexible fluidising mat according to any of the preceding claims, wherein the permeable membrane is formed of that material made and sold under the Registered Trade Mark "VYON".
12. A flexible fluidising mat according to any of the preceding claims, wherein the said backing sheet is formed of rubber.
13. A flexible fluidising mat according to any of the preceding claims, wherein the said spacer sheet is formed of rubber.
14. A flexible fluidising mat substantially as hereinbefore described with reference to and as shown by Figures 1 to 3 and Figure 5 of the accompanying drawing.
15. A container or receptacle having secured to a wall thereof a flexible fluidising mat according to any of the preceding claims.
16. A container or receptacle according to claim 15, wherein a wedge-shaped fillet strip is provided around any edge of the mat on which material might tend to settle.
17. A hopper, having secured to a wall thereof a flexible fluidising mat, substantially as hereinbefore described with reference to and as shown by Figures 4 to 6 of the accompanying drawings.

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COMPLETE SPECIFICATION

2 SHEETS

This drawing is a reproduction of
the Original on a reduced scale

Sheets 1 & 2

FIG. 4.

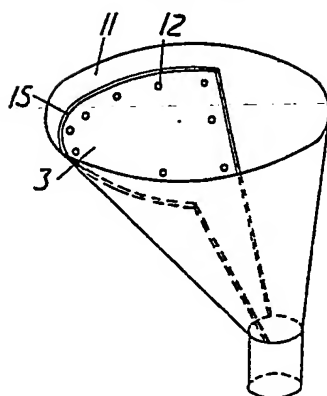


FIG. 5.

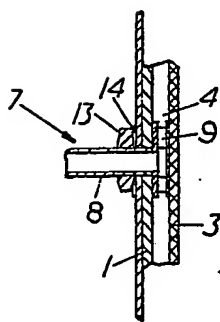
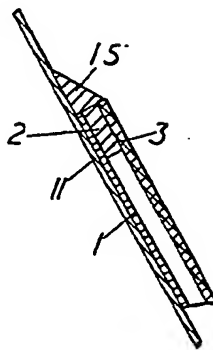


FIG. 6.



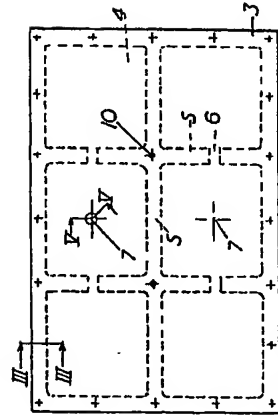


FIG. 1.

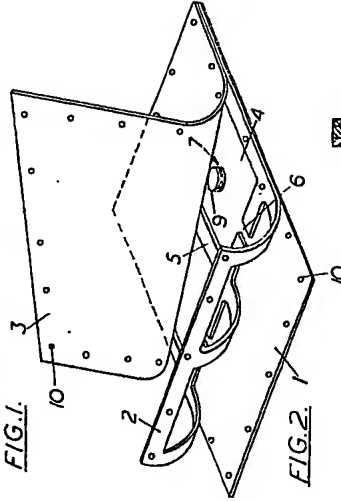


FIG. 2.

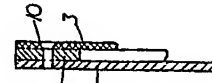


FIG. 3.

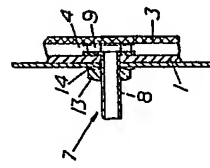


FIG. 5.

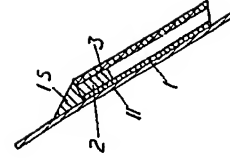


FIG. 6.

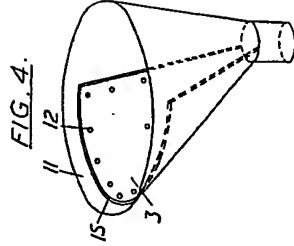


FIG. 4.